PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : A61B 1/00, A61M 25/01 A61B 17/32	A1	(11) International Publication Number: WO 92/1914 (43) International Publication Date: 12 November 1992 (12.11.92

(21) International Application Number: PCT/EP92/00892

(22) International Filing Date: 23 April 1992 (23.04.92)

(30) Priority data:
9109109.0 26 April 1991 (26.04.91) GB

(71)(72) Applicant and Inventor: WILD, Andrew, Michael [GB/GB]; 16 Blakes Way, Eaton Socon, Huntingdon, Camps PE19 3PU (GB).

(74) Agents: BÖHME, Ulrich et al.; Höger, Stellrecht & Partner, Uhlandstrasse 14c, D-7000 Stuttgart 1 (DE).

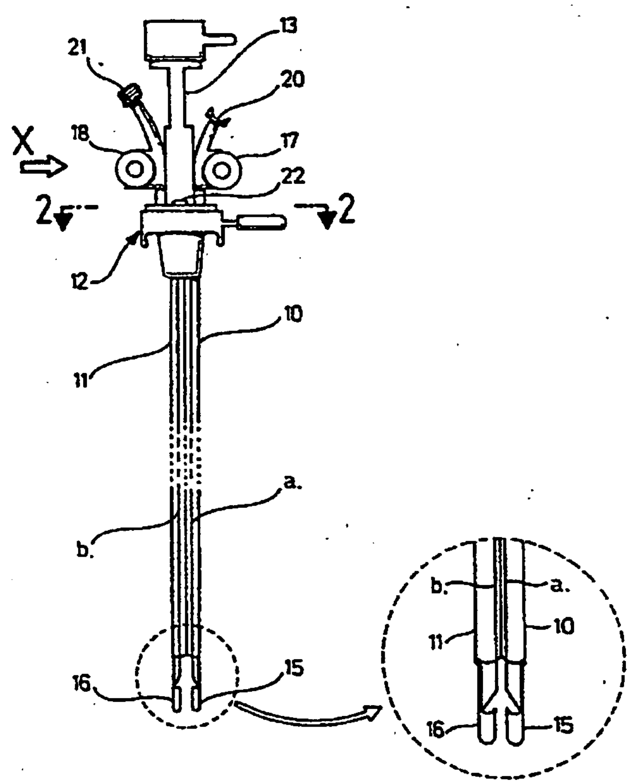
(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), LU (European patent), MC (European patent), NL (European patent), SE (European patent), US.

Published
With international search report.

(54) Title: SURGICAL INSTRUMENT

(57) Abstract

A surgical instrument and endoscope apparatus, for retaining a telescope portion (14) of an endoscope (13) so that it extends down into an operating zone, has a sheath (10, 11) defining two channels for guiding flexible surgical instruments to the operating zone. Surgical instruments for use in the support apparatus are controllable externally of the patient to deflect their operative ends laterally within the operating zone.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria
AU	Australia
BB	Barbados
BE	Belgium
BF	Burkina Faso
BG	Bulgaria
BJ	Benin
BR	Brazil
CA	Canada
CF	Central African Republic
CG	Congo
CH	Switzerland
CI	Côte d'Ivoire
CM	Cameroon
CS	Czechoslovakia
DE	Germany
DK	Denmark
ES	Spain
FI	Finland
FR	France
GA	Gabon
GB	United Kingdom
GN	Guinea
GR	Greece
HU	Hungary
IE	Ireland
IT	Italy
JP	Japan
KP	Democratic People's Republic of Korea
KR	Republic of Korea
LI	Liechtenstein
LK	Sri Lanka
LU	Luxembourg
MC	Monaco
MG	Madagascar
ML	Mali
MN	Mongolia
MR	Mauritania
MW	Malawi
NL	Netherlands
NO	Norway
PL	Poland
RO	Romania
RU	Russian Federation
SD	Sudan
SE	Sweden
SN	Senegal
SU	Soviet Union
TD	Chad
TG	Togo
US	United States of America

SURGICAL INSTRUMENT

Technical Field

The present invention relates to surgical instruments.

Background Art

Surgical instruments for use with rigid or flexible endoscopes are well known in biopsy procedures and certain types of endosurgery. The telescope portion of the endoscope is generally housed within a cannula which also houses the shaft of a single surgical instrument. The operative end of the instrument protrudes from the distal cannula end into the field of view of the endoscope, and is controllable from the proximal end by the surgeon.

Such instruments have been widely used in relatively simple procedures where lateral to and fro manipulation of the operative end of the instrument within the field of view is

not required. Systems permitting manipulation of one flexible instrument end portion in one lateral to and fro direction within the field of view are also known, for example in laser-induced shockwave lithotripsy (LISL) or intra-vesicle electronic lithotripsy, but such systems are not suited to use in delicate or complex procedures such as endoscopic neurosurgery.

It is an aim of the present invention to provide improved or at least alternative surgical instruments, suitable inter alia for delicate and/or complex endoscopic procedures, e.g. where accurate manipulation is required and/or more than one instrument is to be used.

Description of the Invention

According to one aspect of the present invention, there is provided a surgical instrument and endoscope support apparatus for use in endoscopic surgery, the support apparatus comprising means for retaining a telescope portion of an endoscope to permit it to extend down into an operating zone, sheath means defining two channels each extending down into the operating zone and each capable of receiving a flexible surgical instrument and guiding it to the operating zone on advancement down the channel, and instrument deflection means associated with the sheath means at the end of each channel in the operating zone, the deflection means being controllable externally of the patient for moving an operative end of the respective instrument laterally to and fro within the operating zone.

The sheath means may suitably be separate or conjoined rigid tubes to define the two channels. The flexible instruments may be selected from laser fibres, suction tubes, flexible rongeurs and flexible scissors.

The apparatus may if desired define further channels and may include further deflection means. The apparatus may be adapted to retain one (or, less preferably, more) additional rigid surgical instrument so as to extend down into the operating zone.

The deflection means suitably comprise a pair of longitudinally-extending flaps or collars each hingedly connected to the sheath means at the distal end of a respective channel and arranged to be moveable independently of each other and without interfering with each other. Preferably the flaps or collars are each moved by push-pull members passing up to manual control means (e.g. conventional wheel controls) suitably provided on a fixed bridge or platform structure at the proximal sheath end. On release of the tension, the deflection means will conveniently remain in the deflected position.

In this way, flexible instruments can be inserted down the relevant channel into the operating field and the surgeon will be confident that the operative end of the instrument will be guided into, and remain in, the correct position. An instrument can be removed after use and a new one inserted to precisely the same location.

The bridge structure mentioned above is securely fixed to the proximal end of the sheath means. The bridge structure serves as a base for the push-pull control means such as mentioned above, and is provided with ports or apertures to permit the entry of the instruments and endoscope telescope into the channels or otherwise down to the operating zone. The bridge structure may also include irrigation ports etc.

However, the crowding of bridge structures which can easily take place with conventional systems presents significant problems in complex surgery where a number of instruments may be present which may each need to be advanced, retracted, rotated and operated independently of the others.

Where flexible instrumentation is concerned, the problem can be overcome by the use of side or angled ports to keep the instruments and other bridge fixtures apart, but for more complex instrumentation which requires a rigid shaft, or for procedures in which a number of such instruments need to be positioned simultaneously on the bridge, the conventional system cannot be used.

According to a second aspect of the present invention, therefore, there is provided a surgical instrument for use in endoscopic surgery, the instrument having instrument control means and operative means spaced mutually apart by a shaft which is retainable in a suitable support means to extend the operative means down into an operating zone and to present the control means externally of the patient, the operative means

being moveable in response to push-pull control of cable connection means extending between the operative means and the instrument control means, wherein the instrument control means comprises elongate handle means pivotally mounted to the shaft so as to be pivotable between a first and second position to effect said control.

By providing the instrument with an elongate pivoted handle as described above, crowding of a bridge platform with instruments in place in their ports is radically reduced, and instruments can be easily rotated and advanced within their ports without fouling neighbouring handles, particularly when the handle axis is lying substantially parallel to the instrument shaft axis.

The elongate handle is preferably rather wider than the instrument shaft. This is useful in enabling the pivot to be sufficiently offset from the axis of the shaft to provide the necessary leverage when operating push-pull control of the cable connection means passing down the shaft.

The handle is preferably ergonomically configured to permit comfortable gripping and operating by the surgeon's hand. Means may be provided for releasably locking the handle at the desired degree of pivoting.

Actuation of the operative end of the instrument will suitably be by manipulation of additional actuation control means, associated with the elongate handle means but able to function irrespective of the pivotal orientation of the handle. A

convenient such actuation control means is a finger-controlled rocker mechanism mounted to the handle (and preferably arranged and configured in an ergonomically efficient manner), the rocker mechanism being mechanically linked to the operative end of the instrument to actuate and deactuate that end on rocking the mechanism respectively to and fro. The mechanical linkage may, for example, include any or all of tensioning cable connector means, push/pull rods, leve-s, pivots and rocker bars.

A combination form of the instrument according to the second aspect of the present invention may also be desirable in some surgical procedures. Such an instrument comprises a first part and a second part, the two parts being brought together into cooperation for use and the second part consisting of a conventional flexible-shafted endosurgical instrument such as a flexible rongeur or scissor instrument. The first part of the instrument has the instrument control means and operative means spaced mutually apart by a shaft and has the control and operative means of the general types described above, but in addition the shaft is substantially rigid, the operative means comprises a deflector means hinged to the distal shaft end, a longitudinal bore runs the length of the shaft and elongate handle to accomodate the flexible shaft of the second part of the instrument on insertion down the bore from the proximal end, and the bore of the shaft of the first part of the instrument and deflector means are so arranged that on completion of said insertion of the second into the first parts the operative end of the second instrument part lies beside the deflector means and may be moved in response to operation of the elongate handle means.

The elongate handle may if desired be hollow, e.g. to receive a laser optical fibre passing up the instrument shaft, through the interior of the handle and out through the handle end to the laser apparatus. Similarly, a suction tube may pass through the handle.

It is often desirable during a surgical procedure to delicately advance or retract such fibres or tubes to or from the site of operation, and it has been found surprisingly that direct finger pressure on the fibre by the surgeon provides an extremely effective method of advance and retraction.

According to a further aspect of the present invention, therefore, there is provided a surgical instrument comprising handle means and a shaft extending therefrom such that in use the distal end of the shaft lies in an operating zone, the shaft serving to support a first portion of an elongate member (e.g. a flexible fibre or tube) having an operative function and to direct the distal end of the member to the operating zone while permitting the member to move relative to the shaft, wherein the handle means is adapted to support a flexible second portion of the member in spaced apart relationship to a portion of the handle means in a resting condition of the instrument, the arrangement being such that on bringing the second portion of the member and the handle portion mutually together the distal end of the member retracts from the operating zone and on returning the second portion of the member and the handle portion to the resting condition the distal end of the member returns to the operating zone.

The aspect of the invention described above can conveniently be incorporated into instruments having elongate pivotable handles and deflectable operative ends according to the second aspect of this invention to provide a novel and advantageous deflectable and accurately controllable surgical fibre/tube carrying instrument.

It is highly desirable in endoscopic surgical procedures to use pincer instruments, typically for gripping (e.g. forceps) or for bipolar diathermy and the like. It is a further aim of the present invention to provide an improved or at least alternative pincer instrument suitable for use in endoscopic surgery.

According to a third aspect of the present invention therefore, there is provided a surgical instrument for use in endoscopic surgery, the instrument having instrument control means and operative means spaced mutually apart by a shaft, wherein the operative means comprise pincer jaws extending from the shaft and jaw closing and opening means which include a yoke overlying a part of the jaws and cooperating portions of the yoke and jaws arranged so that, on moving yoke longitudinally along the jaws, the cooperating portions engage (e.g. slidingly) with each other to cause the jaws to open or close.

In such an instrument according to the third aspect of the invention the shaft may be rigid or flexible and, where rigid, may suitably be hinged so that the operative end can be

deflected in both the rigid-shafted and flexible-shafted forms for endoscopic procedures. The control means may suitably be provided according to the second aspect of the invention described above, and in particular the operative means may be deflectable in response to a change in tension of cable connection means extending between the operative means and the instrument control means caused by operation of the instrument control means, the instrument control means comprising elongate handle means pivotally mounted to the shaft so as to be pivotable between a first and second position to effect said change in cable tension and may be actuable by manipulation of actuation control means associated with the elongate handle means to move the yoke longitudinally along the jaws to cause the jaws to open or close.

The yoke is preferably retractable over the base portion of the jaws to close the jaws, the yoke inner surface and the jaws outer surface having projections and recesses which cooperate with each other in a cam-type action when the tube is retracted over the jaws causing the jaws to move together. The tube retraction conveniently takes place against a restoring force so that the yoke returns automatically to its resting position when it is desired to open the jaws.

The concept of a kit of surgical instruments for use in an endoscopic surgical procedure, wherein the instruments each have a deflectability function (e.g. integral deflectability) to enable the operative end of the instrument to be brought into the endoscopic field of view after insertion into the sheath, is novel and constitutes a further feature of the present invention.

It has been found that the instrument port design of conventional bridge structures provides insufficient adjustability in the desired degree of advancement of the instrument down the sheath and insufficient and/or inconvenient locking of the instrument at the desired position of advancement and/or rotation about its own axis.

It is a further aim of the present invention to go at least some way toward providing a simple, versatile and reliable releasable locking mechanism for the instrument ports bridge structures for use with complex endoscopic surgical procedures.

According to a still further aspect of the present invention therefore, there is provided a bridge structure for mounting an endoscope and surgical instrument assembly, the bridge structure having at least one instrument port provided on its internal surface with adjustable gripping means capable upon actuation of releasably gripping the instrument in the port.

The adjustable instrument gripping means preferably comprise expansion means provided within the port aperture capable upon actuation of expanding elastically to releasably grip the portion of the instrument within the port aperture. Most preferably, the expansion means may comprise an elastic washer sandwiched between a fixed part and an internally threaded cap which can be screwed down onto the fixed part to squeeze the elastic washer between the two, the arrangement being such that the instrument passes through the cap, washer and fixed part and that on said squeezing the washer is forced against the instrument, the grip being releasable on unscrewing on the cap.

The combination of easy advancement, rotation, deflection and actuation of surgical instruments during complex endosurgical procedures, which the present invention makes available for the first time, is to be particularly stressed. All such movements should be as smooth as possible.

In a preferred form of the invention, suitable particularly for use in neurosurgery, the instruments and the apparatus are all further housed in a rigid cannula, suitably of diameter about 7 to 8 mm, previously inserted into the patient's body to provide a passage between the operating field within the body and the outside world. The cannula is preferably secured to some external system of fixation, and provides further support for the bridge structure and instrumentation, and ancillary equipment.

Brief Description of Drawings

Fig. 1A shows a side view of part of a surgical instrument and endoscope support apparatus prior to insertion of the instruments;

Fig. 1B shows another view of the top part of the apparatus of Fig. 1A looking in the direction of arrow X;

Fig. 2 shows a section on the line 2-2 of Fig. 1 looking in the direction of arrows;

Fig. 3 shows a side view of part of an alternative surgical instrument and endoscope support apparatus prior to insertion of the instruments;

Fig. 4 shows a section on the line 4-4 of Fig. 3 looking in the direction of the arrows;

Fig. 5 shows an enlarged partial vertical cross-section view of the bridge structure illustrated in Fig. 3;

Fig. 6 shows a cannula for receiving the assembly of Fig. 1 or Fig. 3 prior to use in neurosurgery;

Fig. 7 shows a trocar for use in the initial location of the cannula of Fig. 4;

Fig. 8 shows a graph of intracranial pressure vs. irrigation fluid volume;

Fig. 9 shows a schematic view of a neurosurgical system;

Fig. 10 shows a side view of a laser instrument for use in endoscopic surgery;

Fig. 11 shows a view of the handle portion of the instrument of Fig. 10 looking in the direction of arrow A;

Fig. 12 shows a side view of a bipolar instrument for use in endoscopic surgery;

Fig. 13 shows an enlarged partial section view of the distal end of the instrument of Fig. 12;

Fig. 14 shows a side view of a rongeur instrument for use in endoscopic surgery;

Fig. 15A shows a side view of a dissector instrument for use in endoscopic surgery;

Fig. 15B shows an enlarged partial side view of the distal end of the instrument of Fig. 15A;

Fig. 16 shows a side view of a hook instrument for use in endoscopic surgery;

Fig. 17 shows a side view of a forceps instrument for use in endoscopic surgery;

Fig. 18 shows an enlarged partial section view of the distal end of the instrument of Fig. 17;

Fig. 19 shows a side view of a deflection instrument for use with other operative instruments in endoscopic surgery; and

Fig. 20 shows an enlarged view of the distal end of the instrument of Fig. 19 looking in the direction of arrow B.

Modes for Carrying out the Invention

For ease of understanding of the present invention, embodiments will now be described, without limitation and by way of example only, with reference to the accompanying drawings.

Figs. 1 and 3 show alternative forms of a basic endoscope and double instrument support apparatus (omitting the two operative instruments) including two instrument sheaths 10,11, a bridge structure 12 attached to the proximal sheath end and a conventional endoscope 13 releasably mounted to the bridge structure so that the telescope portion 14 of the endoscope passes through the bridge structure and down alongside the instrument sheaths 10,11. Part 11 is not visible in Fig. 3 and part 14 is not visible in Fig. 1.

In Fig. 1 the distal sheath ends are each provided with a deflector 15,16 mounted on arms hinged to the distal sheath end and moveable independently of each other under the surgeon's control from the bridge structure via conventional push-pull control members a,b and wheels 17,18. The deflectors are shaped to move towards and away from the field of view of the endoscope so as to deflect any appropriately flexible instrument, protruding from a distal sheath 10,11 end, into the endoscope field of view and laterally to and fro across the field of view.

The bridge structure 12 shown in Fig. 1 includes two conventional curved ports 20,21 for receiving flexible instrumentation and one conventional linear port 22 for receiving rigid instrumentation.

Referring particularly to Fig. 2, the bridge structure is provided with apertures 24,25,26,27 for receiving respectively the endoscope telescope, the first flexible instrument inserted through port 20, the second flexible instrument inserted through port 21, and a third rigid instrument (not shown) which is inserted through port 22. Apertures 25 and 26 are, of course, aligned with sheaths 10,11.

The control wires a,b for controlling the deflectors 15,16 pass up in pairs from the deflectors (to which they are attached in known manner) alongside the respective sheath and through the bridge structure via respective small apertures 28,29 to the respective wheels 17,18.

Referring to Figs. 3 to 5, where generally like parts are designated as above, two sheaths 10,11 are present of which one is shown, but these do not have their own deflector mechanisms as the instrumentation to be used (which will be described in more detail below) each has integral deflection functionality where necessary.

Accordingly, the bridge structure 12 of Figs. 3, 4 and 5 is simpler than that shown in Figs. 1 and 2, and generally provides for the four apertures 24,25,26,27 but without the control wire apertures.

The bridge structure 12 in Fig. 3 has two specialised entry ports 31,32 (positioned above bridge apertures 26,27 respectively) for instrumentation (although any number of such

ports may be used as desired). For neurosurgical use two or three such ports 31,32 are preferred.

The entry ports 31,32 are adapted to releasably grip the instrumentation, as is shown in more detail in Fig. 5. Referring to Fig. 5, which shows only port 32 for clarity, the bridge structure 12 is provided with an externally threaded, centrally perforated, protrusion 34 onto which screws a threaded centrally perforated cap 36, and an elasticly deformable washer 38 is sandwiched between the protrusion and the cap. Once an instrument (not shown) has been inserted into the port and is positioned as desired, the cap 36 is screwed tight and the washer 38 grips the instrument to prevent accidental or undesired movement.

To advance, retract or rotate the instrument, the cap 36 is first loosened and then retightened if necessary after the instrument has been moved.

The novel ports of the assembly of Fig. 3 are extremely compact and easy to operate, thereby considerably simplifying the bridge structure. They permit instrumentation to be advanced, rotated and retracted, and retained in location with great accuracy.

For maximum simplicity of the bridge structure, it is preferred that an instrument assembly including the novel bridge mechanism shown in Fig. 3 should also include novel integrally deflectable instrumentation as will be described below with reference to Figs. 10 to 20.

Before describing such novel specialised instrumentation, however, brief reference will be made to a preferred neurosurgical technique employing the assemblies illustrated in Figs. 1 to 5. Referring also to Figs. 6 to 9, a cannula 40 of generally conventional construction (and having in particular ports 42 (only one, fluid exit, port being illustrated) for irrigation fluid to relieve crowding of ports on the bridge structure), is first inserted in conventional manner into the patient's brain through surface tissue by means of a trocar 44, which has a rounded tip to avoid cutting vessels but is elongated sufficiently to part the brain tissue.

The cannula should have the smallest possible outside diameter necessary to accommodate all desired instrumentation. Normally a maximum cannula diameter of about 7 to 8 mm will be satisfactory for neurosurgical procedures.

The length of the cannula will be selected in known manner according to the desired depth of operation and the system of fixation employed.

An assembly according to Figs. 1 to 5 is then inserted into the positioned cannula 40 in the direction shown by the arrow in Fig. 6, to bring the distal end of the sheaths 10,11 into alignment with the cannula distal end in the zone of operation.

A generally conventional system of fixation (not shown in the illustrations) may be used with the apparatus, to provide a solid support, particularly to the cannula and bridge

structure, while retaining maneuverability and ergonomic praticality where required by the surgeon. The system of fixation should also provide adequate support for extra systems such as video cameras or teaching attachments.

The endoscope used will suitably be a conventional monocular endoscope of relatively small diameter telescope (e.g. down to about 1.95 mm). It is important that the illumination of the endoscope field of view is adequate, and this may suitably be achieved using a fairly large diameter fibre-optic cable or using fluid cables. Teaching and recording aids such as compatible video or stills cameras and compatible flash facilities may also be provided in conventional manner.

During the neurosurgical procedure, control and fail-safe mechanisms are important, to ensure that when irrigation fluid such as artificial cerebrospinal fluid (artificial CSF) is used (e.g. for work within the ventricles or with mechanical aspirators) the intracranial pressure does not rise unduly.

Fig. 8 illustrates the relationship between the volume of irrigation fluid supplied to the cranial cavity and the resultant intracranial pressure, and shows how the intracranial pressure can rise sharply at higher fluid volumes.

Figure 9 illustrates schematically a preferred control system in which the pressure of both the voluntary suction and the passive fluid escape systems are monitored and regulated continuously, and are used to apply signals to a fluid input control gate controlling the supply of irrigation fluid from a reservoir.

Referring now to Figs. 10 to 19, there is shown a range of novel specialised instrumentation suitable particularly for use in neurosurgical procedures with the housing and support assembly of Fig. 3.

The instruments all possess a novel projecting elongate ergonomic handle 51 which allows for extremely simple and fine control from above the bridge structure 12, and permits more than one instrument to be positioned in the bridge structure in relatively close proximity to each other, while permitting any one such instrument to be rotated, advanced, retracted and operated manually without the handle fouling the handles of the other instrument(s).

The ergonomic handle 51 in each case is pivotably jointed at 52 to the proximal end of the instrument shaft 53 so as to be pivotable between a first (resting) condition in which the handle axis lies generally parallel to the axis of the instrument shaft and a second (operative) condition in which the handle axis lies at an angle to the axis of the instrument.

It is this pivotable movement of the handle which controls deflection of the operative distal end 54 of the instrument via an internal cable connection preferably comprising a push-pull wire pair 50 (shown only in Fig. 10 for clarity) between the handle 51 and the operative end 54 which is operated by the movement of the handle to deflect the operative end.

The illustrations are purely for exemplification of some of

the possible instrument constructions, and are not to be taken as limiting on the scope of the invention.

Turning now to Figs. 10 and 11, a laser instrument is illustrated having an ergonomic handle 51 to provide specific instrument control highly suited to the surgeon's requirements.

The laser instrument has a thin rigid shaft 53 (maximum diameter suitably about 3 mm), with a straight top edge to reduce interference with neighbouring instruments, receivable in the appropriate sheath 10 or 11, the shaft 53 housing a thin (core diameter about o.4 or 0.6 mm for unsheathed fibre and 1.8 mm for cooled fibre) optical fibre 56 for carrying the pulsed laser energy (typically from a Neodymium YAG laser, wavelength 1064 nm, output power adjustable up to 100 mJ, pulse duration c. 8 ns and frequency adjustable up to 50 Hz) which emerges at the operative distal end 54. The optical fibre 56 protrudes at its distal end through a terminal hole in a cable-operated deflection cage 58 and which serves to point the distal end of the optical fibre (which may optionally have a sapphire tip) in the desired direction.

The deflection cage 58 is hinged to the shaft 53 at 60 and is deflected in the to and fro direction (arrow X) by corresponding pivotal movement of the handle 51 about pivot 52 (arrow Y).

Coarse control of advancement/retraction of the instrument within the sheath 10 is by means of the constricting port mechanism 32 described above. Fine control of advancement/retraction of the optical laser fibre 56 is by

simple index finger pressure by the surgeon on an exposed portion 56a of that section of the fibre that passes through the interior of the handle 51. For this purpose, it is provided that the fibre is to be moveable longitudinally within the instrument.

The shaft 53 diameter is suitably about 2.5 mm and the shaft length suitably about 152 mm; the handle 51 diameter is suitably about 10 mm and the handle length suitably about 75 mm.

Referring to Figs. 12 and 13, in which like parts are designated as above and function in analogous manner, a specialised bipolar instrument is illustrated.

In this instrument, the operative end 54 of the instrument is not hinged to the shaft 53, but the shaft 53 is hollow and receives a flexible inner member made in a conventional spiral wire 55 and core arrangement. The deflection control wires 57 pass from the handle 51 to an anchor point 59 at the distal end of the flexible member and offset from the central axis of the system.

The bipolar instrument has a pair of jaws 69,70 to which electric current is supplied via a standard foot control by means of insulated wires (not shown), for diathermy procedures. The jaws are moveable to close and open by means of a retractable yoke 72 overlying a part of the operative end and provided with internal ribs 73,74 which cooperate with depressions in the jaws surfaces when the yoke is moved up the instrument to create a mutually inward movement of the jaws.

The yoke is pulled against a restoring force by a cable connector (not shown) linking the yoke to a rocker mechanism 75 pivoted on the handle 51, the surgeon can depress one side or the other of the rocker mechanism to either tension or detension the cable connector to retract or release the yoke as desired.

The shaft 53 diameter is suitably about 2.5 mm and the shaft length suitably about 152 mm; the handle 51 diameter is suitably about 10 mm and the handle length suitably about 75 mm.

Referring to Fig. 14, in which like parts are designated as above and function in analogous manner, a specialised rongeur instrument is illustrated.

Biopsy rongeurs require a larger mechanical advantage on the cutting edge to provide a clean cutting action, and this is achieved in the illustrated embodiment by using a rocker actuation control mechanism 75 as previously described, so widening the handle 51.

The rongeur blades 78,79 are opened using the index finger and closed with the middle finger and thumb grip.

The shaft 53 is formed in malleable stainless steel and is provided with a hinge at 60, which allows the operative head 54 to be deflected at the field of operation, using the pivoted handle 51 (deflection control wires omitted from the drawings for clarity).

The mechanical actuation linkage between the rocker mechanism and the rongeur blades 78,79 is suitably via a push-pull rod system about a pivot point 80 and via a flexible corner linkage at 81.

Referring to Figs. 15 and 16, in which like parts are designated as above and function in analogous manner, a specialised endoscopic dissector and hook are illustrated.

Both of these instruments add to the versatility of an operating set and some surgeons prefer to use a hook or dissector rather than scissors.

With the endoscopic hook and dissector instruments, a pincer/closure action is not required, and the operative end 54 is deflected as desired using the pivoted handle 51 as already described.

Referring to Figs. 17 and 18, in which like parts are designated as above and function in analogous manner, a specialised forceps instrument is illustrated.

Forceps are used as general grasp instruments and require the same smooth advance and deflection mechanism.

The forceps jaws 84,85 are closed by retracting an outer sheath 86 over a camming arrangement in a manner analogous to closure of the bipolar instrument illustrated in Figs. 12 and 13. However, the instrument of Figs. 17 and 18 is hinged at 60 (in contrast to the arrangement in Figs. 12 and 13), and the operative end 54 is deflected as desired using the pivoted handle 51 as already described.

Referring finally to Figs. 19 and 20, a suitable deflector instrument is shown, to permit the use of bendable instruments, including generally scissors, rongeurs, suction instruments, flexible bipolars etc.

Deflection control wires (not shown) pull on a hinged H-shaped frame 90, as shown more clearly from side B in Fig. 20, using the pivoted handle 51 as already described, and move the H-frame in the direction shown by the curved arrow in the enlarged detail of Fig. 19.

The instrument is shown with an adaptable handle, including the elongate "pencil-grip" type handle 51 as previously described, but also a conventional pistol-grip flexible rongeur handle 91 for actuating the flexible rongeur 92 the shaft of which passes right down a bore in the handle 51 and shaft 53 to emerge beside the H-frame at the operative end 54.

Other possible instrumentation which may be used with the assembly described above include an endoscopic suction system (not illustrated). The suction system is linked to the irrigation system to maintain adequate fluid flow and prevent intracranial pressure rises. This is important with intraventricular surgery. Deflection functions analogously to those previously described should preferably be incorporated in the suction instrument, to avoid the constant need to reposition the cannula. Alternatively, a conventional plastic sucker pipe can be inserted alongside the deflection instrument illustrated in Figs. 19 and 20, to rest against the cross-bar of the H-frame, so that movement of the H-frame will direct the suction pipe to the required position.

All the instruments described above may be used with the novel bridge structure illustrated in Fig. 3, with the smooth advance and retraction functions of each instrument being provided by the specialised entry ports 31,32.

Industrial Applicability

In summary, the present invention enables a complete kit of surgical instruments having all the necessary functions for complex and delicate endosurgical procedures. The above examples are given for illustration purposes only, and are not to be taken as limiting on the scope of the invention.

C L A I M S

1. A surgical instrument and endoscope support apparatus for use in endoscopic surgery, the support apparatus comprising means for retaining a telescope portion of an endoscope to permit it to extend down into an operating zone, sheath means defining two channels each extending down into the operating zone and each capable of receiving a flexible surgical instrument and guiding it to the operating zone on advancement down the channel, and instrument deflection means associated with the sheath means at the end of each channel in the operating zone, the deflection means being controllable externally of the patient for moving an operative end of the respective instrument laterally to and fro within the operating zone.

2. Apparatus as claimed in claim 1, in which the deflection means comprise a pair of longitudinally extending members each hingedly connected to the sheath means at the distal end of a respective channel and arranged to be movable independently of each other and without interfering with each other.

3. Apparatus as claimed in claim 2, in which the longitudinally extending members are each movable by push-pull members operable by manual control means provided on a fixed structure at the proximal end of the sheath means.

4. Apparatus as claimed in any preceding claim, in which the sheath means comprises rigid tubes to define the two channels.

5. Apparatus as claimed in any preceding claim, in which the flexible instruments are selected from laser fibres, suction tubes, flexible rongeurs and flexible scissors.

6. Apparatus as claimed in any preceding claim, adapted to retain at least one additional rigid surgical instrument extending down into the operating zone.

7. A surgical instrument for use in endoscopic surgery, the instrument having instrument control means and operative means spaced mutually apart by a shaft which is retainable by support means to extend the operative means down into an operating zone and to present the control means externally of the patient, the operative means being movable in response to push-pull control of cable connection means extending between the operative means and the instrument control means, wherein the instrument control means comprises elongate handle means pivotally mounted to the shaft so as to be pivotable between first and second positions to effect said control.

8. An instrument as claimed in claim 7, in which the elongate handle is wider than the instrument shaft.

9. An instrument as claimed in claim 7 or 8, including means for releasably locking the handle at a desired degree of pivoting.

10. An instrument as claimed in any one of claims 7 to 9, including additional actuation control means, associated with the elongate handle means but able to function irrespective of the pivotal orientation of the handle.

11. An instrument as claimed in claim 10, in which the actuation control means comprises a finger-controlled rocker mechanism mounted to the handle, the rocker mechanism being mechanically linked to the operative end of the instrument to actuate and deactuate that end on rocking the mechanism respectively to and fro.

12. An instrument as claimed in claim 7, further comprising a first part and a second part, the two parts being brought together into cooperation for use, the second part consisting of an endosurgical device having a flexible guide element, the first part of the instrument having the instrument control means and operative means spaced mutually apart by the shaft, in which the shaft is substantially rigid and has a longitudinal passageway to accomodate the flexible guide element of the second part of the instrument on insertion from

the proximal end, and the operative means comprises a deflector means hinged to a distal end of the shaft, the arrangement being such that on completion of said insertion of the second into the first part the operative end of the second instrument part lies beside the deflector means and is movable in response to operation of the elongate handle means.

13. An instrument as claimed in claim 12, in which the elongate handle is hollow, for receiving an elongate member passing up the shaft, through the interior of the handle and out through the handle end to external apparatus.

14. An instrument as claimed in claim 7, wherein the shaft serves to support a first portion of an elongate member having an operative function and to direct the distal end of the member to the operating zone while permitting the member to move relative to the shaft, wherein the handle means is adapted to support a flexible second portion of the member in spaced apart relationship to a portion of the handle in a resting condition of the instrument, the arrangement being such that on bringing the second portion of the member and the handle portion mutually together the distal end of the member retracts from the operating zone and on returning the second portion of the member and the handle portion to the resting condition the distal end of the member returns to the operating zone.

15. A surgical instrument comprising handle means and a shaft extending therefrom such that in use the distal end of the shaft lies in an operating zone, the shaft serving to support a first portion of an elongate member having an operative function and to direct the distal end of the member to the operating zone while permitting the member to move relative to the shaft, wherein the handle means is adapted to support a flexible second portion of the member in spaced apart relationship to a portion of the handle in a resting condition of the instrument, the arrangement being such that on bringing the second portion of the member and the handle portion mutually together the distal end of the member retracts from the operating zone and on returning the second portion of the member and the handle portion to the resting condition, the distal end of the member returns to the operating zone.

16. A surgical instrument for use in endoscopic surgery, the instrument having instrument control means and operative means spaced mutually apart by a shaft, wherein the operative means comprise pincer jaws extending from the shaft and jaw closing and opening means which include a yoke overlying part of the jaws and cooperating portions of the yoke jaws arranged so that, on moving the yoke longitudinally along the jaws, the cooperating portions engage with each other to cause the jaws to open or close.

17. A surgical instrument as claimed in claim 7, wherein the operative means comprise pincer jaws extending from the shaft and jaw closing and opening means which include a yoke

overlying part of the jaws and cooperating portions of the yoke jaws arranged so that, on moving the yoke longitudinally along the jaws, the cooperating portions engage with each other to cause the jaws to open or close.

18. An instrument as claimed in claim 16 or 17, in which the shaft is flexible.

19. An instrument as claimed in claim 16 or 17, in which the shaft is rigid and hinged so that the operative end is deflectable.

20. An instrument as claimed in any one of claims 16 to 19, in which the yoke is retractable over the base portion of the jaws to close the jaws, the yoke inner surface and the jaws outer surface having projections and recesses which cooperate with each other when the tube is retracted over the jaws causing the jaws to move together.

21. An instrument as claimed in claim 20, including means for restoring the yoke to a resting position in which the jaws are open.

22. A bridge structure for mounting an endoscope and surgical instrument assembly, the bridge structure having at least one instrument port provided on its internal surface with adjustable gripping means capable upon actuation of relaesably

gripping the instrument in the port.

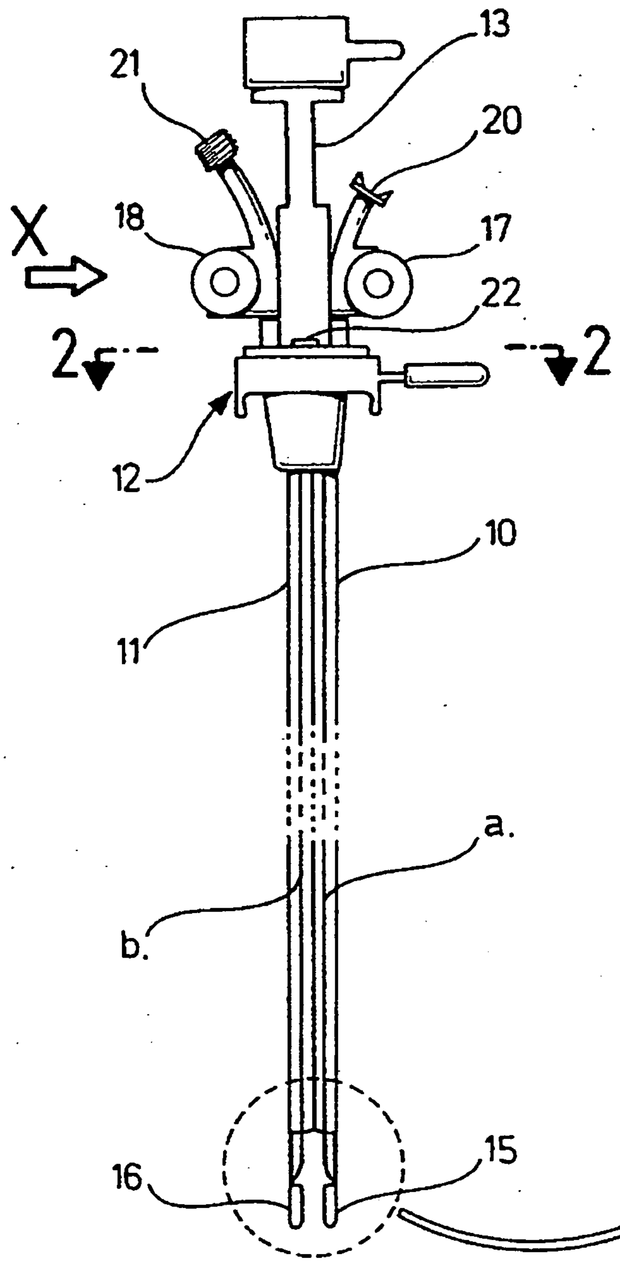
23. A bridge structure as claimed in claim 22, in which the adjustable instrument gripping means comprises expansion means provided within the port aperture capable upon actuation of expanding elastically to releasably grip a portion of the instrument within the port aperture.

24. A bridge structure as claimed in claim 23, in which the expansion means comprises an elastic washer sandwiched between a fixed part and an internally threaded cap adapted to be screwed down onto the fixed part to squeeze the elastic washer between the two, the arrangement being such that the instrument passes through the cap, washer and fixed part and that on said squeezing the washer is forced against the instrument, the grip being releasable on unscrewing of the cap.

25. Apparatus as claimed in claim 3, in which said fixed structure comprises a bridge structure as claimed in any one of claims 22 to 24.

26. Apparatus as claimed in any one of claims 1 to 6, further comprising a rigid cannula for insertion into a patient's body to provide a passage for communication with the operating field.

FIG.1A



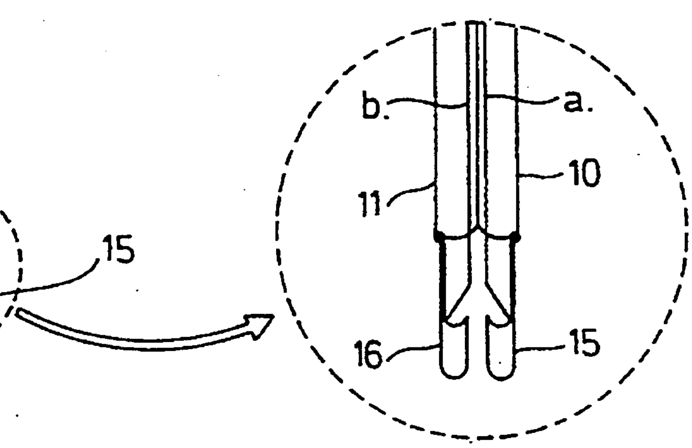


FIG.1B

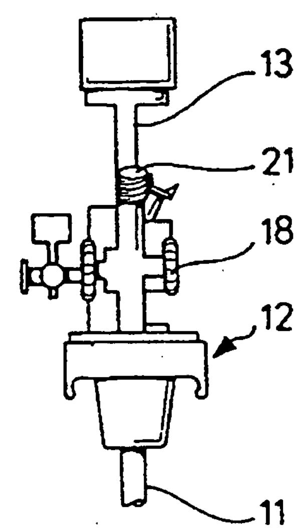


FIG. 2

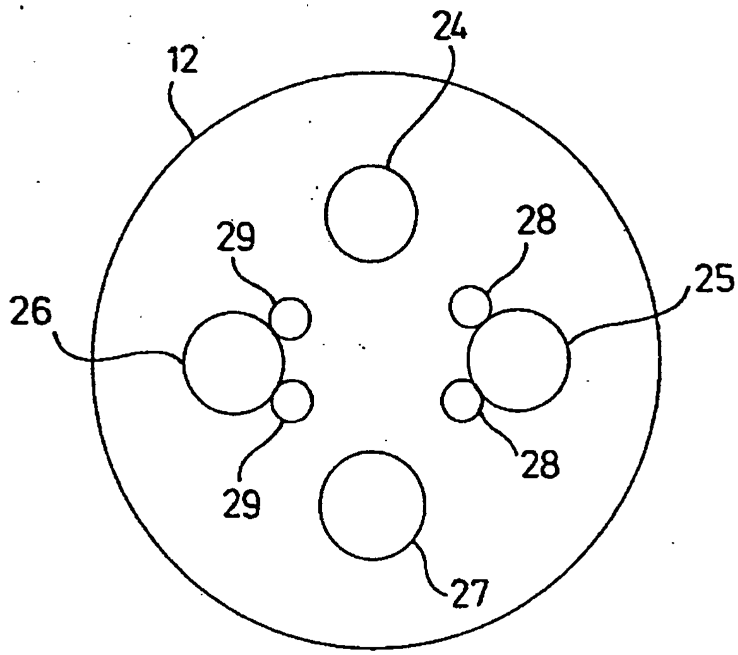


FIG. 4

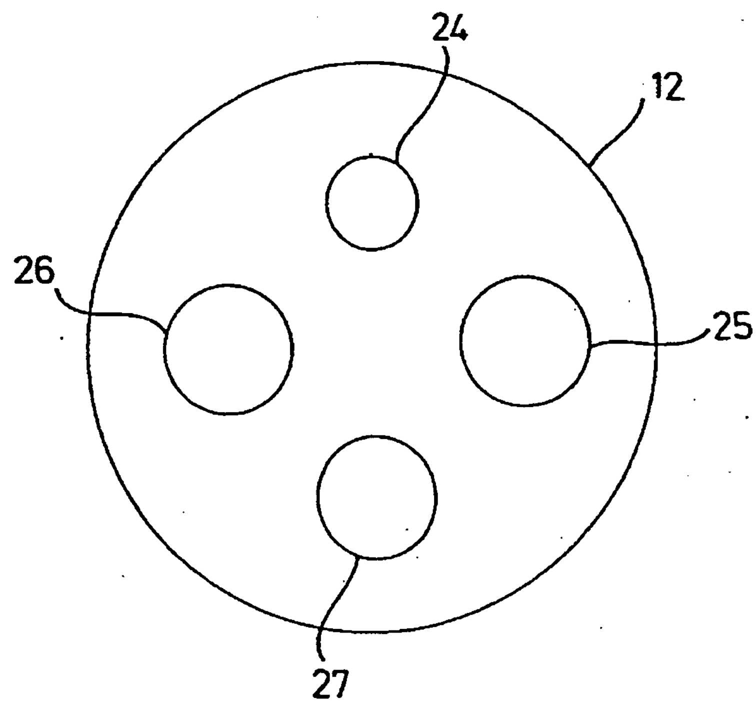


FIG. 3

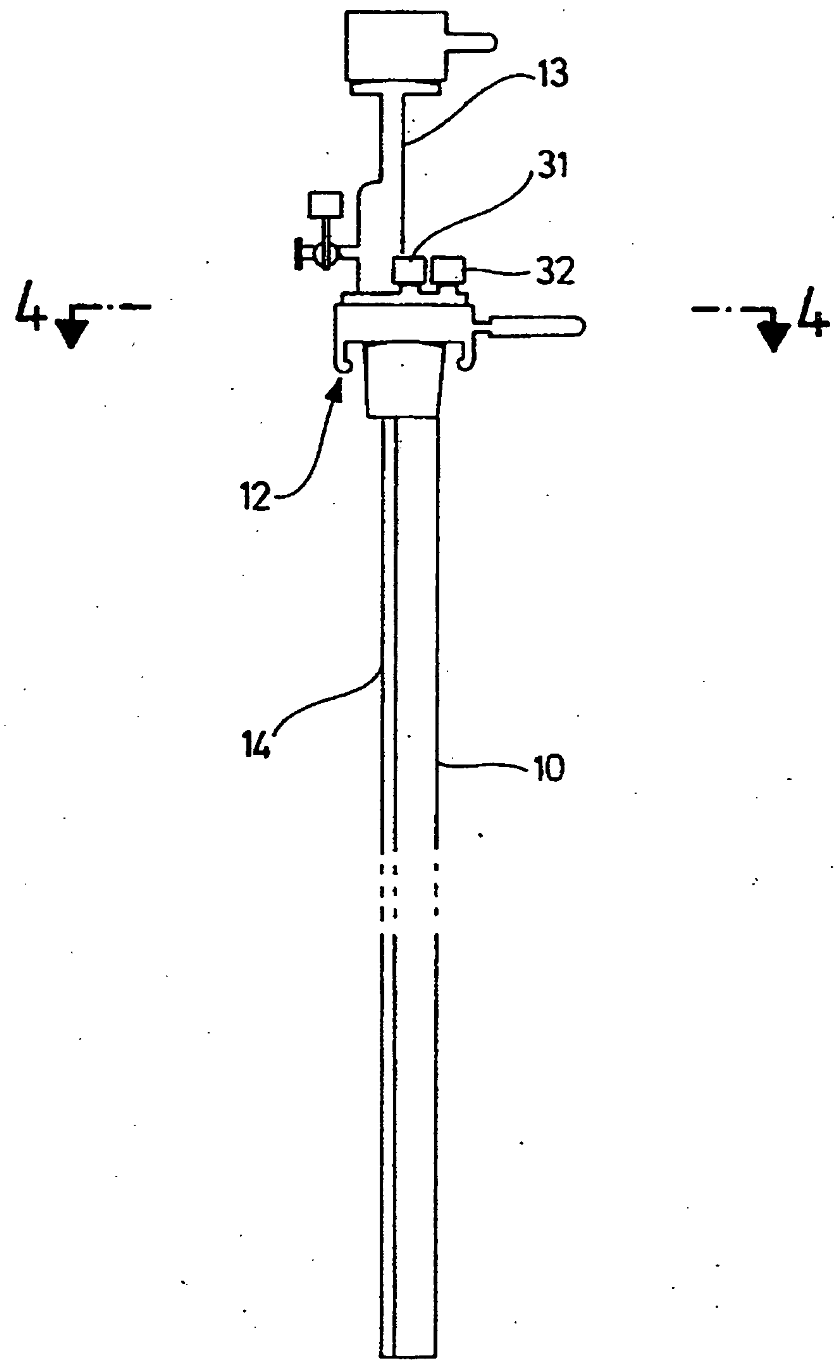


FIG.5

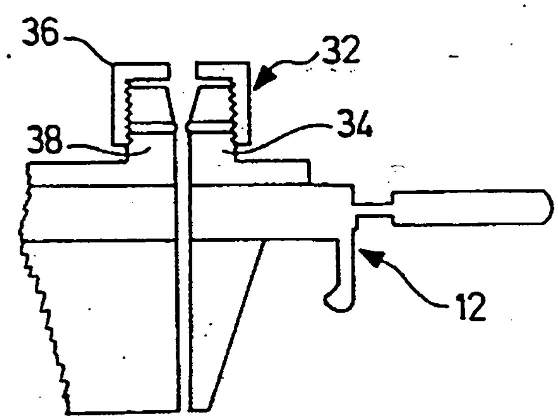


FIG.8

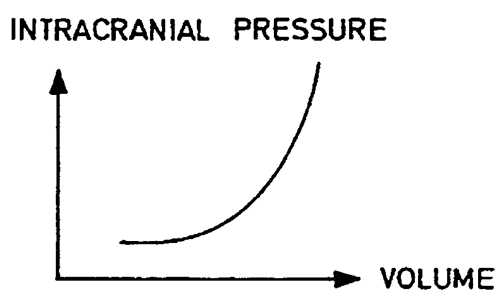


FIG.9

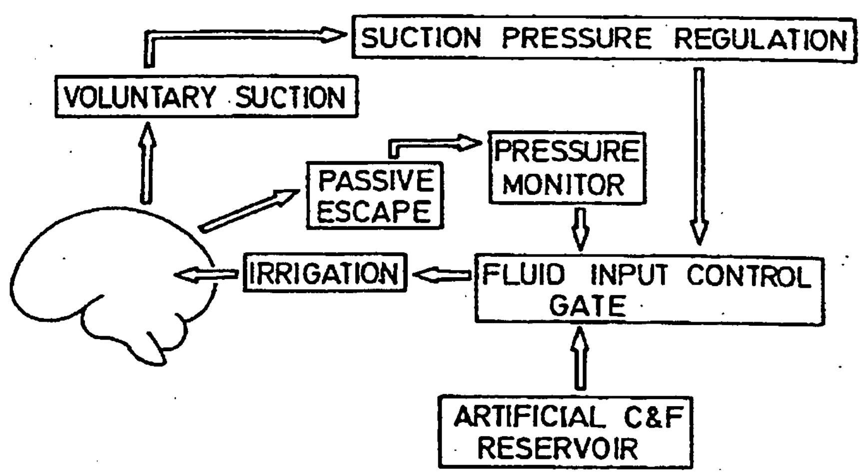


FIG.6

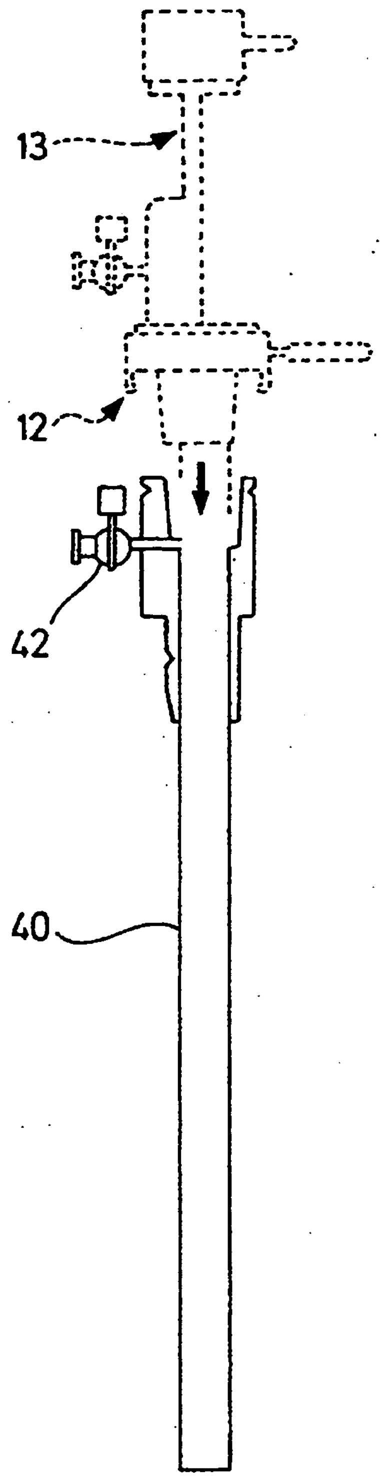


FIG. 7

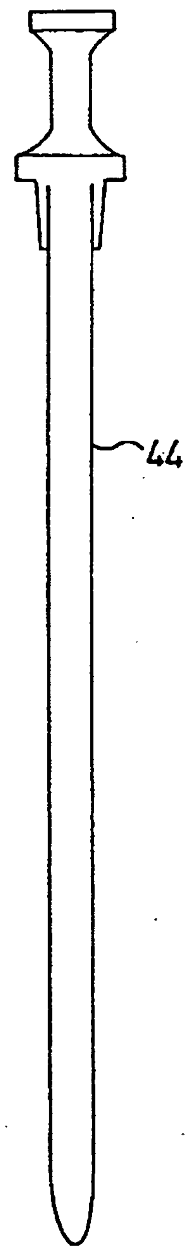


FIG. 10

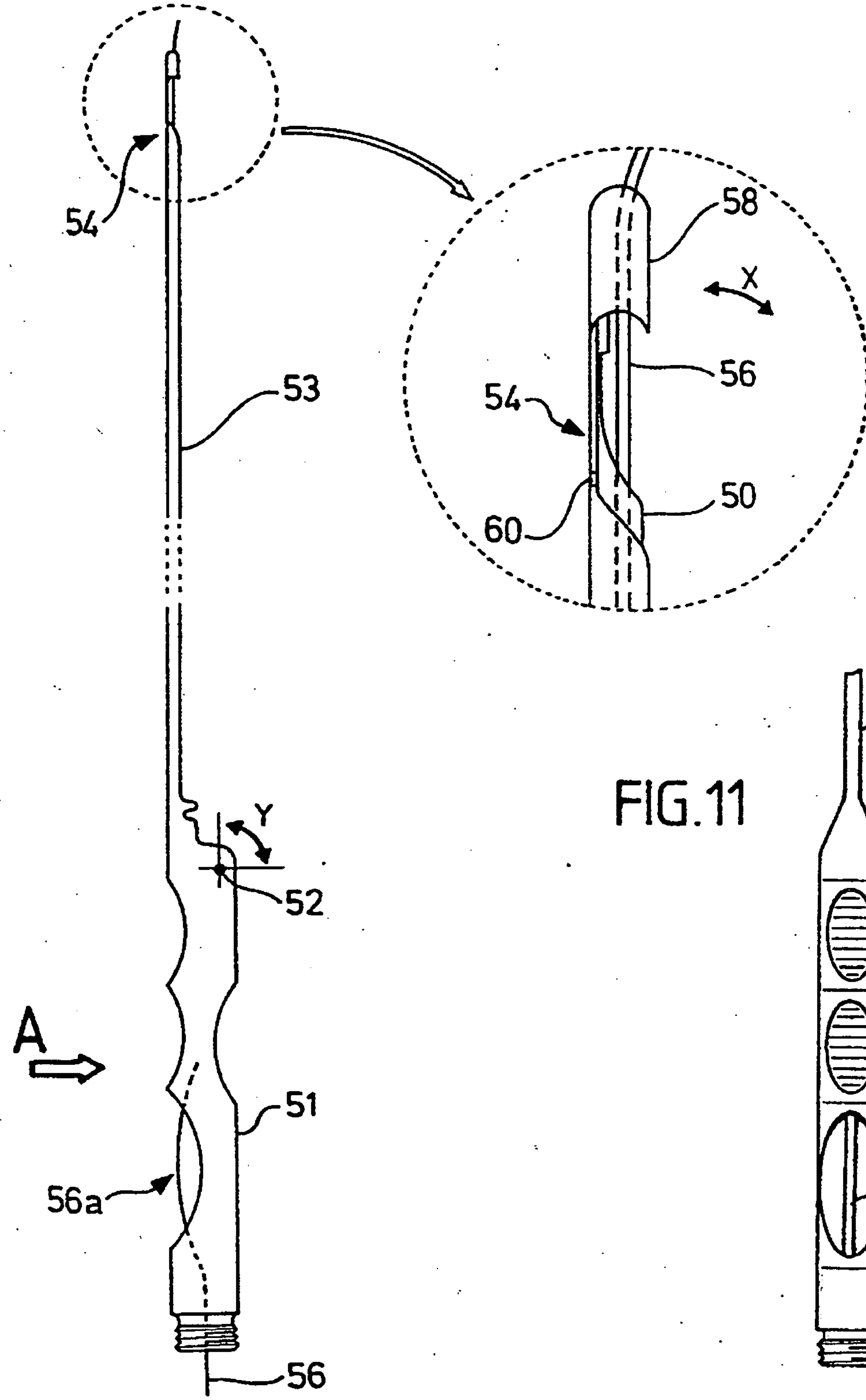


FIG.11

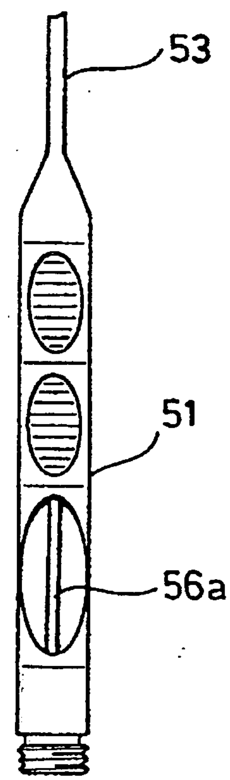


FIG. 12

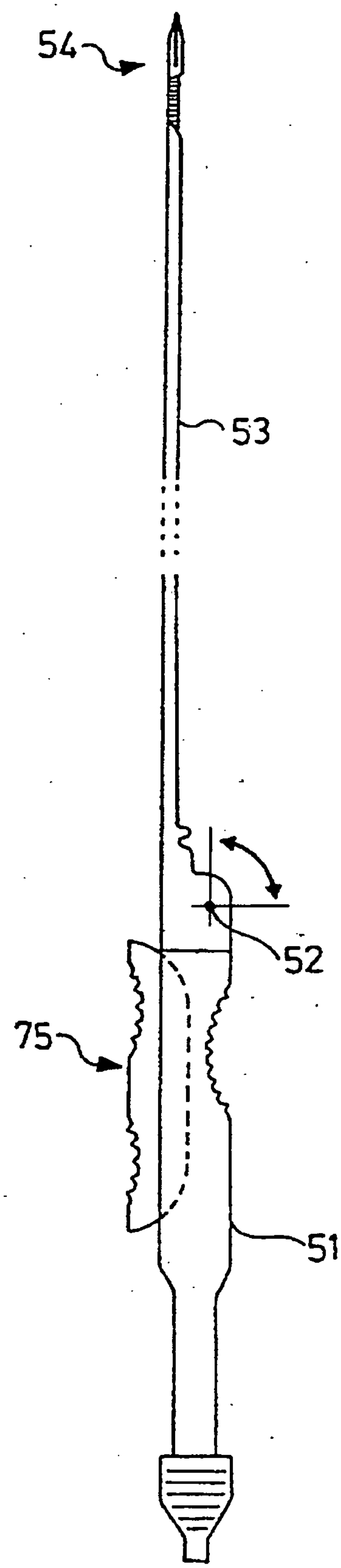


FIG. 13

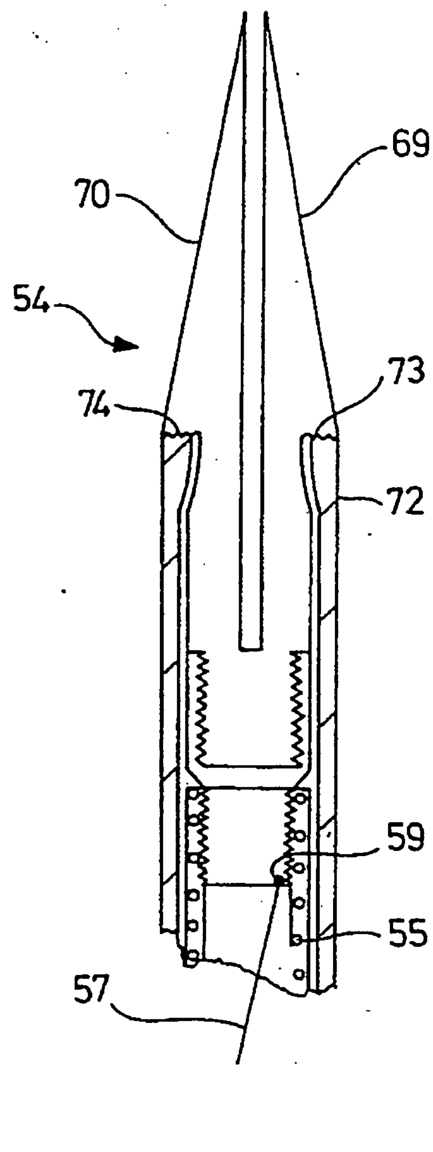


FIG.14

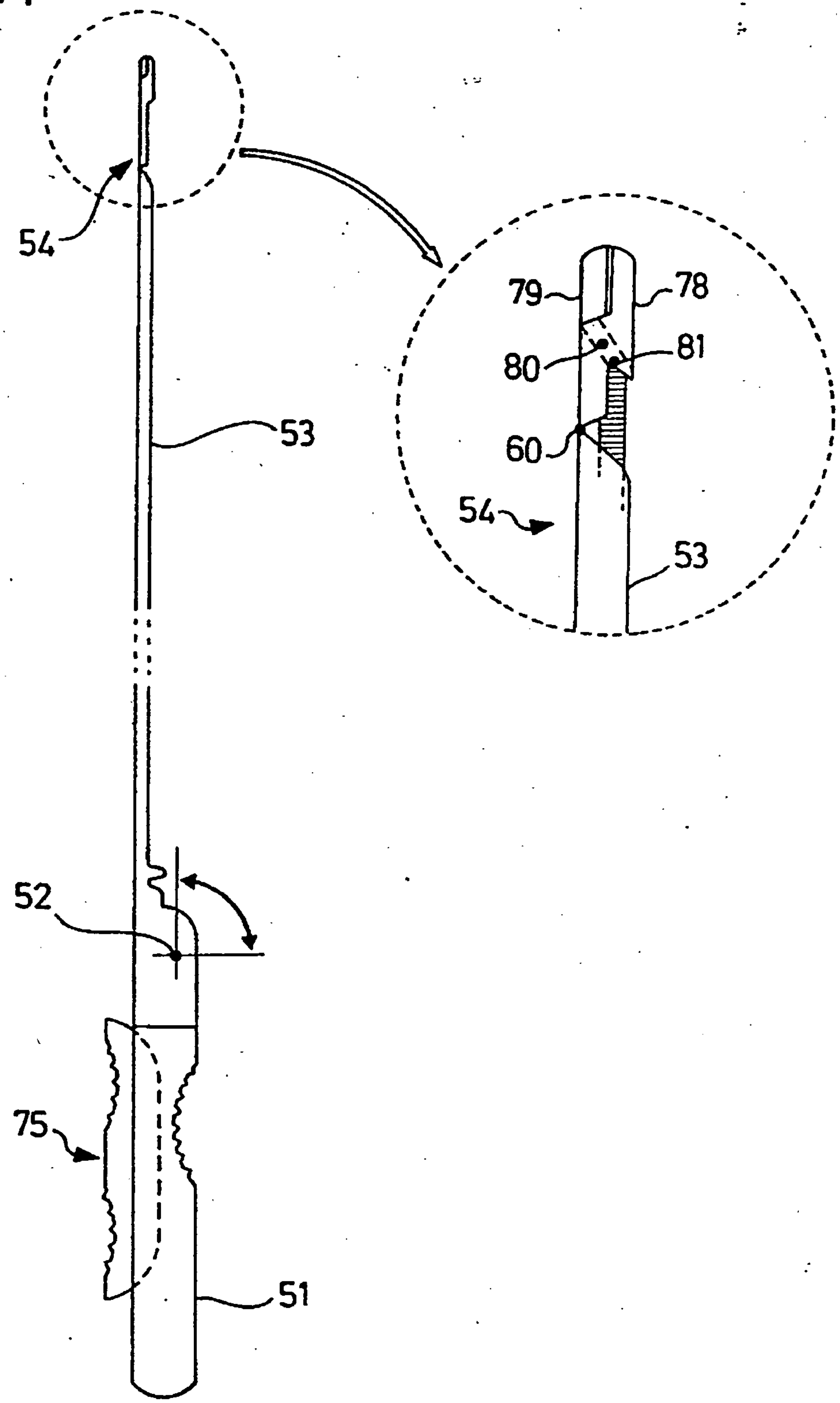


FIG. 15A

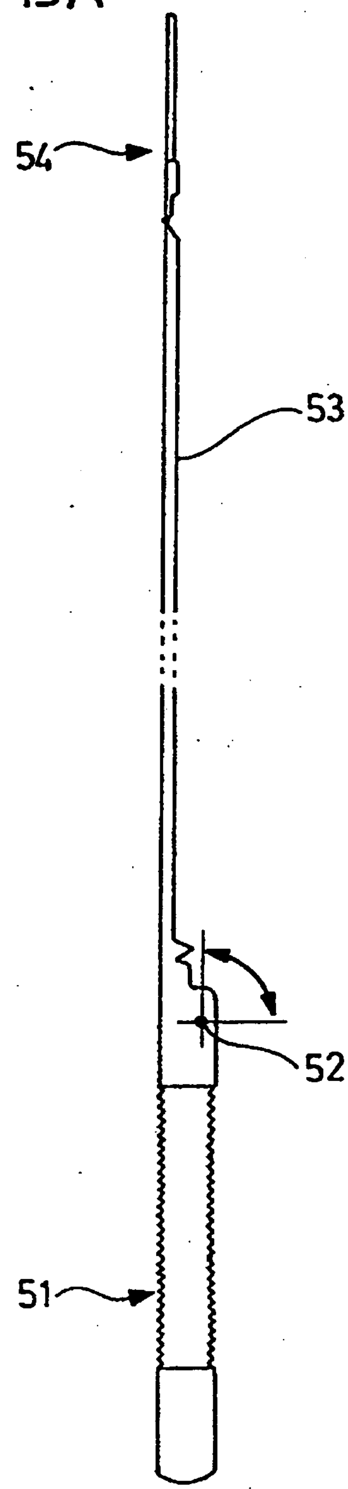
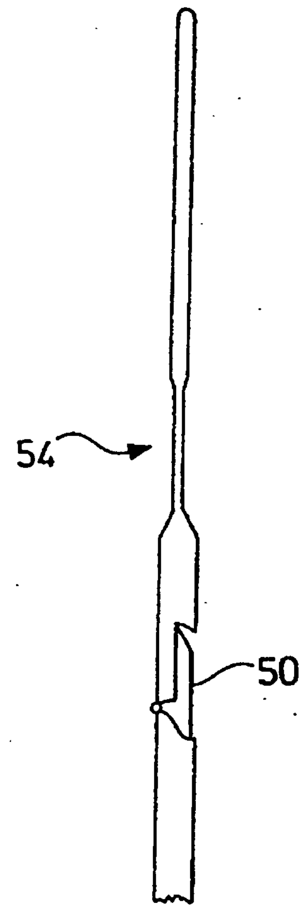


FIG. 15B



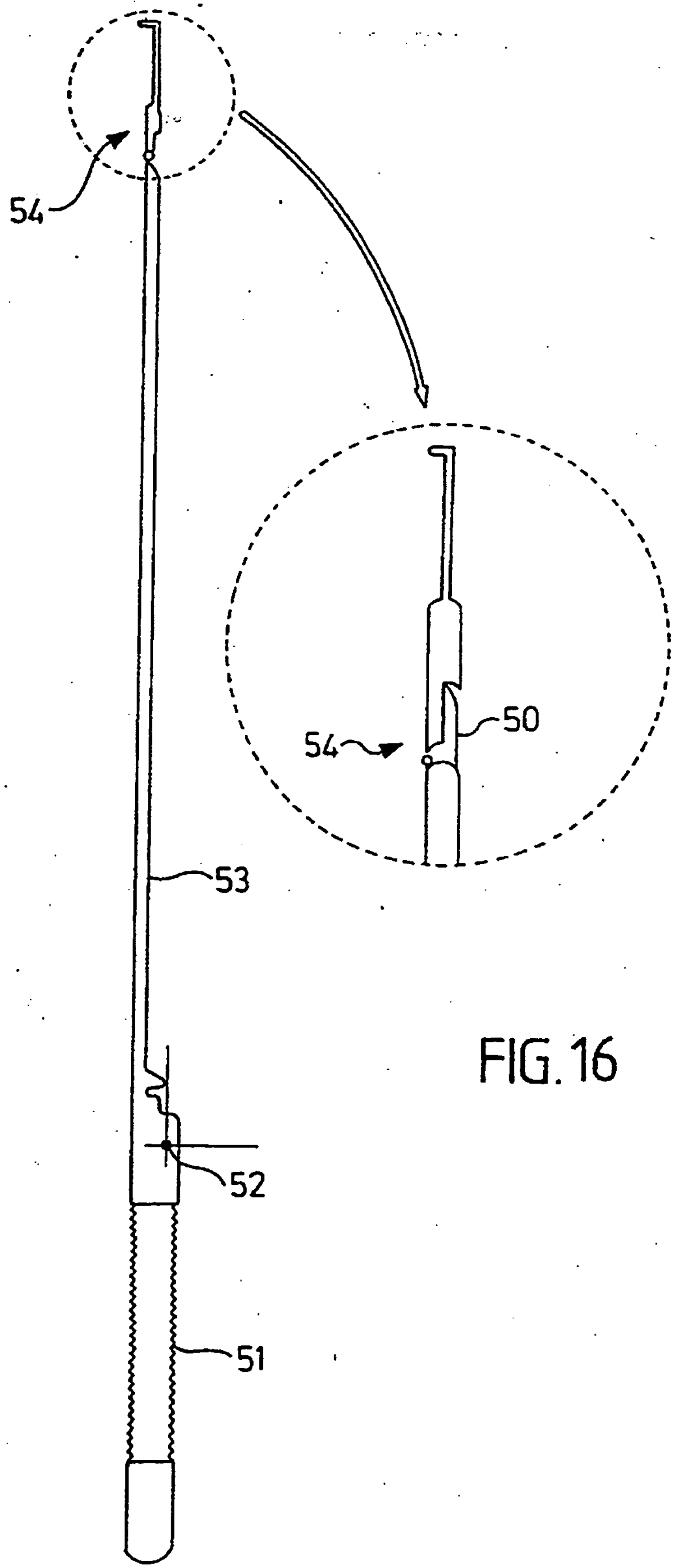


FIG. 16

FIG. 17

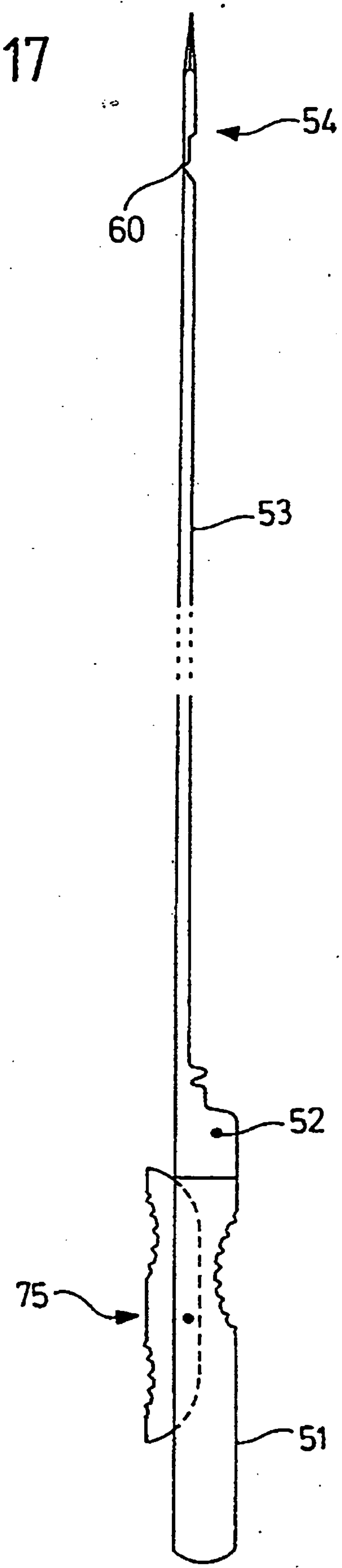


FIG. 18

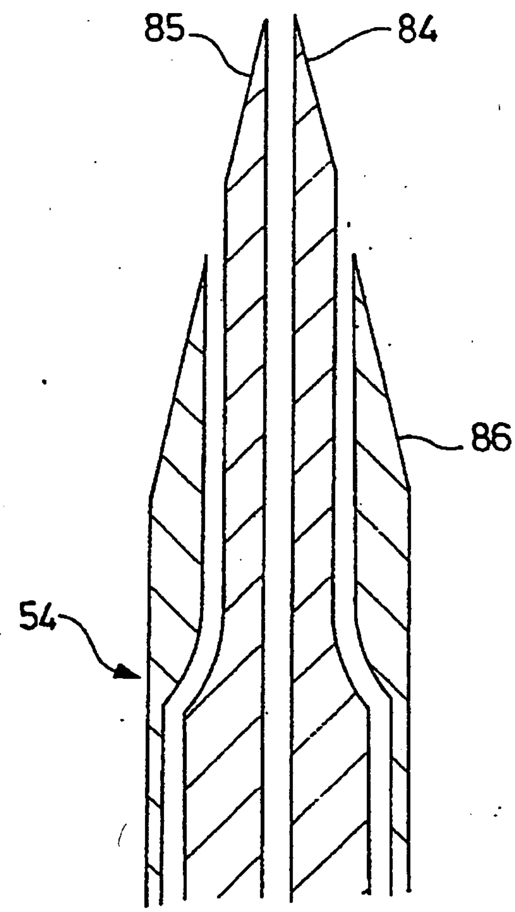


FIG.19

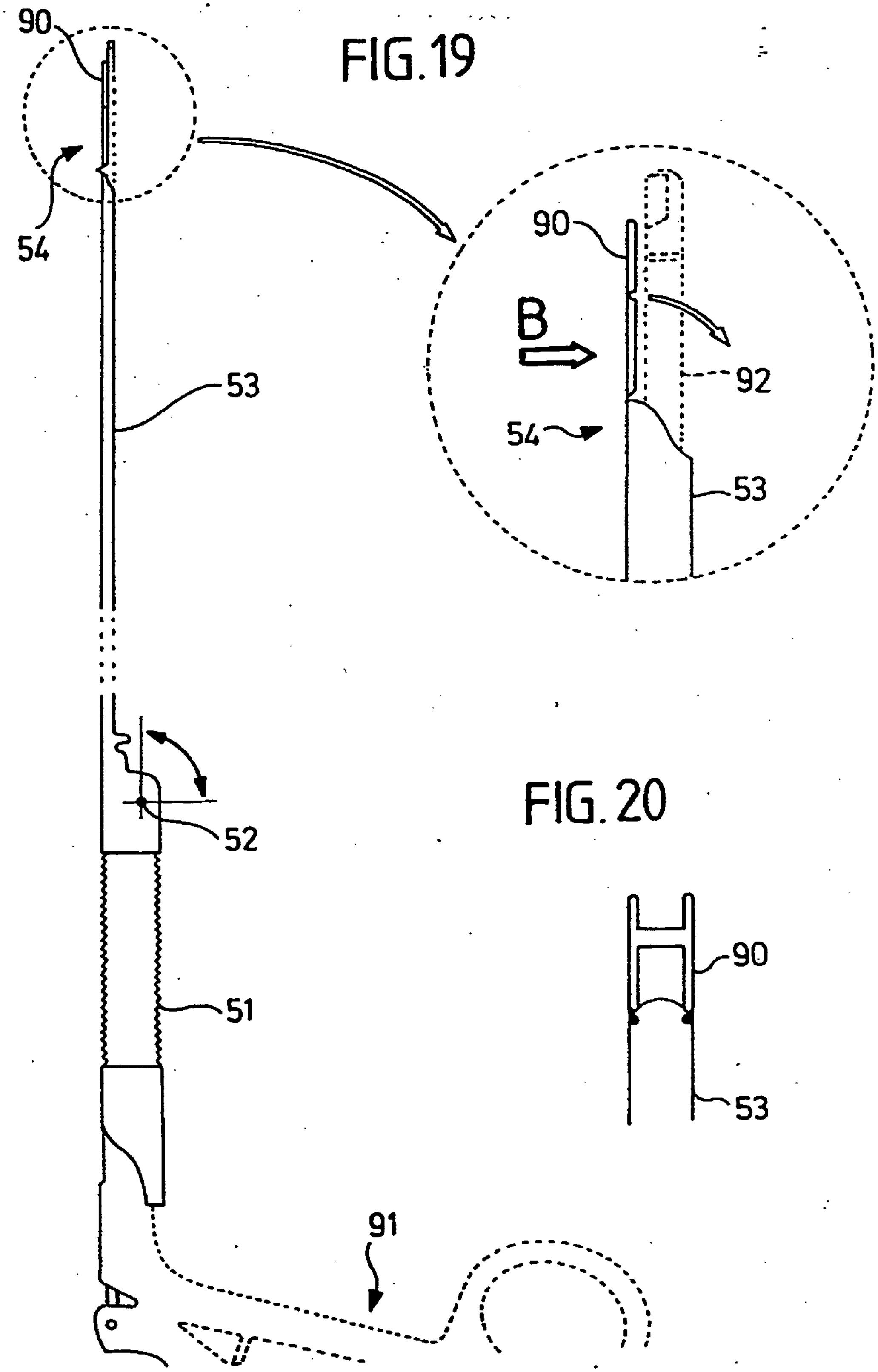


FIG.20

INTERNATIONAL SEARCH REPORT

International Application No PCT/EP 92/00892

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 A61B1/00; A61M25/01; A61B17/32

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	A61B ; A61M

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No.[13]
X	US,A,2 038 394 (WAPPLER) 21 April 1936 see page 1, left column, line 1-47 see page 3, right column, line 1 - page 4, left column, line 34 see figures 9-16	1-3,5, 22-25
A		7,15
A	US,A,1 679 950 (STERN) 7 August 1928 see page 1, line 102 - page 2, line 72; figures	1
A	GB,A,2 004 749 (AMERICAN HOSPITAL SUPPLY CORPORATION) 11 April 1979 see abstract; figures	1
A	US,A,4 586 923 (GOULD ET AL.) 6 May 1986 see column 8, line 53 - column 9, line 7 see abstract; figures 1,2,6	1

-/--

° Special categories of cited documents : [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
05 AUGUST 1992	12.08.92
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	GIMENEZ BURGOS R.

1

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	EP,A,0 422 887 (KABUSHIKI KAISHA MACHIDA SEISAKUSHO) 17 April 1991 see abstract; figures ---	1
A	US,A,4 112 932 (CHIULLI) 12 September 1978 see column 3, line 59 - column 4, line 4 see abstract; figures ---	1,24
A	US,A,4 750 475 (YOSHIHASHI) 14 June 1988 see abstract; figures ---	1,7

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. EP 9200892 SA 58577

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 05/08/92
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A-2038394		None		
US-A-1679950		None		
GB-A-2004749	11-04-79	US-A-	4178920	18-12-79
		BE-A-	870950	01-02-79
		DE-A-	2843151	12-04-79
		FR-A-	2404421	27-04-79
		JP-A-	54058986	12-05-79
US-A-4586923	06-05-86	None		
EP-A-0422887	17-04-91	JP-A-	3128024	31-05-91
		JP-A-	3128025	31-05-91
US-A-4112932	12-09-78	None		
US-A-4750475	14-06-88	None		

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82